2011 UCR CE-CERT and Shanghai Jiao Tong University Student Research Symposium

7th Year!

December 8, 2011
UC Riverside
CE-CERT:

College of Engineering-
Center for Environmental Research and Technology

• collaborative research center focused on air quality, transportation, and energy

• brings together academia, industry, and government to develop and assess new technologies

• interdisciplinary center of approximately 45 full-time faculty and staff plus 50 graduate and undergraduate students

• contracts and grant activity at approximately $8M per year
CE-CERT’s Mission

- Education and training at all levels:
  - graduate students (Ph.D., M.S.)
  - undergraduate students (design projects, RAP)
  - K – 12 education outreach

- Technical Research Papers
- Conduct research to improve the technical basis for regulation
- Intellectual Property: future environmental technology, transportation systems, and renewable energy systems, in partnership with the private sector
Emissions and Fuels Research
Emissions measurement/analysis, fuel effects, new instrumentation/methods, after-treatment

Transportation Systems Research
Intelligent Transportation Systems, vehicle activity, energy/emissions modeling

Atmospheric Processes Research
Secondary pollutant formation, mitigation methods, environmental modeling

Sustainable Energy Research
Cellulosic ethanol, synthetic diesel fuel, distribution

Solar Energy Research (SC-RISE)
Solar device research, solar thermal, applications, training

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Emissions and Fuels Research Laboratory

- Emission Measurement and Characterization
- Planes, Trains, Trucks, Automobiles
- On-Road Emission Measurements: **new PEMS Research Program**
- Advanced Emission Control Technology
- Fuel Effects
  
  Recently launched a new center of excellence in alternative fuels (biofuels) funded by the California Energy Commission

- Stationary Sources: Commercial Cooking
Intelligent Transportation Systems and Vehicle Technology Research Laboratory

- Intelligent Transportation Systems
  new ECO-Friendly ITS Research Program
- Vehicle Activity Analysis
- Transportation and Emissions Modeling
- Vehicle Guidance, Sensing, and Control
  major effort in vehicle positioning
- Advanced Vehicle Technology: EVs, hybrids
- Fuel Cells and Reformers
Atmospheric Processes Research Laboratory

- Atmospheric Chamber for Gas and Particle Studies
  
  *Keck Foundation instrumentation grant; national user facility designation*

- Air Sampling and Monitoring

- Analysis and Modeling
  
  *new research program in cloud research related to global climate change*

- Chemical Analysis
Sustainable Energy Research Laboratories

- **Renewable (cellulosic) Alcohol Fuels**
- **Alternative Fuels: Biomass to Liquid**
  - major research grant (CEC: $2M) in steam hydrogasification of bio-waste
- **Coal to Synthetic Diesel Fuel**
Southern California Research Initiative in Solar Energy

- **Fundamental Research in Solar Devices and Solar Thermal**
- **Applied Research**
- **Training and Outreach**
Winston Chung Global Energy Research Center

- Fundamental Research in Energy Storage and Distribution
- Applied Research
- Training and Outreach
May 2011: New Center initiated with a $10M gift from Winston Chung (Winston Energy Systems)
Winston Chung Global Energy Center

- major research challenge: energy storage
- energy distribution is also another key topic area
- Goal of new research center:
  to take a holistic approach to addressing energy storage research needs and issues, broadly ranging from technical issues, economic development, and ecological wellness

- Targeted Research Areas:
  - Innovative Materials for Advanced Energy Storage and Battery Technologies
  - Energy Storage Platform Integration and Distribution
  - Education, Outreach, and Industrial Collaboration
Citiwide Grid Connected Smartgrid Testbed System
(Line Diagram)

RPU Grid

University Substation

Multiple Substations

Hunter Substation

1 MW Solar Farm
West Campus

1.08 MWh Battery Storage
Winston Chung Hall

L2 Charger
Lot 1

0.982 MW PV
Solar Farm
CE-CERT/BOURNS

Fast Charger
CE-CERT/BOURNS
Trolley Route

0.968 MWh Battery Storage
CE-CERT/BOURNS

Lot 30

L2 Charger
Lot 15

14 L2 Chargers
City of Riverside

18 kW PV
Array

32 kWh Battery Storage

4 Vehicle Charging
Station

8 kW PV
Array

2 Vehicle Charging
Station

16 kWh Battery Storage

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www.scrise.ucr.edu
UCR Planned Solar, Battery Energy Storage and EV Charging

- **UCR Lot 1 EV**
- **UCR Lot 15 EV**
- **UCR Lot 30 EV**
- **Bourns & CE-CERT Facility**
- **West UCR Solar**

**2 MW Solar PV** (blue)
- 1.0 MW West Campus
- 1.0 MW CE-CERT Facility
- 6 kW UCR Lot 30

**2 MW hrs Battery** (green)
- 0.8 MW hrs CE-CERT Facility
- 0.8 MW hrs West UCR
- 0.4 MW hrs Lot 30

**EV Chargers** (red)
Recent CE-CERT Initiatives

• Working more closely now with UCLA on health effects Cocker/Karavalakis/Durbin

• Increased activity in evaluating off-road emissions (funded by CARB and others) Johnson/Miller/Durbin

• Major effort in Portable Emissions Measurement Systems (PEMS) Johnson/Miller/Durbin

• Major effort now in Eco-Driving Technology and evaluation ($1.2+ funded by DOE; CARB, etc.) Barth/Boriboonsomsin/Todd

• All dynamometer facilities active Durbin/Johnson
Recent CE-CERT Faculty Additions

• Prof. Sadrul Ula joins CE-CERT as research faculty (solar, smartgrid, distributed power)

• New faculty hire: Phillip Christopher in chemical/environmental engineering (biofuels)

• New faculty hire: Qi Zhu and Wei Ren in electrical engineering doing work in distributed transportation systems